United States Patent [19]

Myer

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[54] **TWO-DIMENSIONAL OPTICS ELEMENT FOR CORRECTING ABERRATIONS**

[75] Inventor: **Jon H. Myer**, Woodland Hills, Calif.

[73] Assignee: **Hughes Aircraft Company**, Los Angeles, Calif.

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 261,315, May 1, 1981, abandoned.

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[52] **U.S. Cl.** **350/96.12**; 350/96.18

[58] **Field of Search** 350/96.11, 96.12, 96.15, 350/96.18, 433, 432, 442, 358

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,551,852	5/1951	Rinia	350/443
3,917,384	11/1975	Harper et al.	350/96.18
4,345,815	8/1982	Righini et al.	350/96.18
4,403,825	9/1983	Tangonan et al.	350/96.11

OTHER PUBLICATIONS

Righini et al., Proceedings of Society of Photo-Optical Instrum. Engineers, Netherlands, Oct. 10–13, 1978, SPIE, vol. 164, pp. 20–26, "Signal Processing . . . ".

Vahey, Ultrasonics Symposium Proceedings, Cherry Hill, N.J., U.S.A., Sep. 25–27, 1978, pp. 70–73, "Corrected Waveguide Geodesic Lenses . . . ".

Hatakoshi et al., Optica Acta, Aug. 1979, vol. 26, No. 8, 961–968, "Optical Waveguide Lenses".

Naumaan et al., Appl. Phys. Lett., 35(3), Aug. 1, 1979, pp. 234–236, "A Geodesic Optical Waveguide Lens Fabricated by Anisotropic . . . ".

Kassai et al., Topical Meeting on Integrated and Guided-Wave Optics, Salt Lake City, Utah, U.S.A., Jan. 16–18, 1978, MA2-1–4, "Aberration Corrected . . . ".

Vahey et al., IEEE J. of Quantum Electronics, vol. QE-13, No. 4, Apr. 1977, pp. 129–134, "Focal Characteristics of Spheroidal Geodesic Lenses . . . ".

Myer et al., Applied Optics, vol. 20, No. 3, Feb. 1, 1981, pp. 412–416, "Diffraction Limited Geodesic Lens: A Search for Substitute Contours".

Chen et al., Appl. Phys. Lett., 33(6), Sep. 15, 1978, pp. 511–513, "Diffraction Limited Geodesic Lens for Integrated Optical Circuits".

Barnoski et al., 1978 Ultrasonics Symposium Proceedings, 1978, "Design, Fabrication and Integration of Components for an Integrated . . . ".

Giallorenzi, Topical Meeting on Integrated and Guided Wave Optics, Salt Lake City, Utah, U.S.A., Jan. 16–18, 1978, MA1-1–3, "An Overview of Microoptic Signal . . . ".

Primary Examiner—William L. Sikes

Assistant Examiner—Frank González

Attorney, Agent, or Firm—A. W. Karambelas; K. W. Float

[57] **ABSTRACT**

Auxiliary depressions, disposed in the substrate of an integrated optic device which employs geodesic lenses, to adjust the effective focal distance of the geodesic lenses and correct optical aberrations of the geodesic lens system are disclosed. The integrated optic device comprises a substrate, a planar waveguide disposed thereon, a laser source at one end and a detector array at the other end, and geodesic lenses disposed in the substrate. The auxiliary surface depressions are non-spherical, symmetrical about a longitudinal axis and disposed in the substrate between either end of the substrate and the geodesic lens closer to that end. By increasing the path length of light transmitted along the surface layer, these auxiliary depressions allow adjustment of the effective focal distance of the geodesic lenses. Also, non-symmetrical auxiliary surface depressions which correct for optical aberrations in the geodesic lens system are disclosed.

12 Claims, 4 Drawing Figures